

US10575505 revised  
SEQUENCE LISTING

<110> Helmholtz-Institut fuer Infektionsforschung GmbH  
Ferrer, Manuel  
Chernikova, Tatjana  
Golyshin, Peter  
Timmis, Kenneth  
Yakimov, Michail

<120> Transgenic organisms with lower growth temperatures

<130> FERRER ET AL-1

<150> EP 03023032.0

<151> 2003-10-13

<160> 28

<170> PatentIn version 3.5

<210> 1

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<212> PRT

<213> artificial sequence

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<223> Cpn10 of Oleispira antarctica

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Glu Lys Pro Asn Gln Gly Val Val Ile Ser Val Gly Thr Gly Arg Ile  
35 40 45

Leu Asp Asn Gly Ser Val Gln Ala Leu Ala Val Asn Glu Gly Asp Val  
50 55 60

Val Val Phe Gly Lys Tyr Ser Gly Gln Asn Thr Ile Asp Ile Asp Gly  
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Glu Glu Leu Leu Ile Leu Asn Glu Ser Asp Ile Tyr Gly Val Leu Glu  
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<213> artificial sequence

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<223> Cpn60 of oleispira antarctica

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Pro Lys Gly Arg Asn Val Val Ile Glu Lys Ser Phe Gly Ala Pro Ile  
35 40 45

Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Lys Asp  
50 55 60

Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln  
65 70 75 80

Ala Asn Asp Gln Ala Gly Asp Gly Thr Thr Ala Thr Val Leu Ala  
85 90 95

Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn  
100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Thr Ala Ala Val Val  
115 120 125

Ala Ala Ile Lys Glu Gln Ala Gln Pro Cys Leu Asp Thr Lys Ala Ile  
130 135 140

Ala Gln Val Gly Thr Ile Ser Ala Asn Ala Asp Glu Thr Val Gly Arg  
145 150 155 160

Leu Ile Ala Glu Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr  
165 170 175

Val Glu Glu Gly Lys Gly Leu Glu Asp Glu Leu Asp Val Val Glu Gly  
180 185 190

Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Ile Asn Asn Gln  
195 200 205

Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp  
210 215 220

Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val  
225 230 235 240

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Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly  
245 250 255

Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys  
260 265 270

Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met  
275 280 285

Leu Gln Asp Leu Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu  
290 295 300

Leu Gly Met Ser Leu Glu Thr Ala Asp Pro Ser Ser Leu Gly Thr Ala  
305 310 315 320

Ser Lys Val Val Ile Asp Lys Glu Asn Thr Val Ile Val Asp Gly Ala  
325 330 335

Gly Thr Glu Ala Ser Val Asn Thr Arg Val Asp Gln Ile Arg Ala Glu  
340 345 350

Ile Glu Ser Ser Thr Ser Asp Tyr Asp Ile Glu Lys Leu Gln Glu Arg  
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Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Gly  
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Ser Glu Met Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu  
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His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val Ala Gly Gly Gly  
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Val Ala Leu Ile Arg Ala Leu Ser Ser Val Thr Val Val Gly Asp Asn  
420 425 430

Glu Asp Gln Asn Val Gly Ile Ala Leu Ala Leu Arg Ala Met Glu Ala  
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Pro Ile Arg Gln Ile Ala Gly Asn Ala Gly Ala Glu Gly Ser Val Val  
450 455 460

Val Asp Lys Val Lys Ser Gly Thr Gly Ser Phe Gly Phe Asn Ala Ser  
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Thr Gly Glu Tyr Gly Asp Met Ile Ala Met Gly Ile Leu Asp Pro Ala  
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490

495

Lys Val Thr Arg Ser Ser Leu Gln Ala Ala Ala Ser Ile Ala Gly Leu  
500 505 510

Met Ile Thr Thr Glu Ala Met Val Ala Asp Ala Pro Val Glu Glu Gly  
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Ala Gly Gly Met Pro Asp Met Gly Gly Met Gly Gly Met Gly Gly Met  
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Pro Gly Met Met  
545

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<400> 4

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Thr Thr Gln Gln Asp Asn Leu Tyr Thr Gly Val Met Ser Leu Ala Arg  
35 40 45

Asp Ser Ala Gly Leu Glu Val Lys Thr Ala Ser Ala Gly Asp Val Asn  
50 55 60

Leu Thr Tyr Met Glu Arg Gln Gly Ser Asp Lys Asp Asn Ala Glu Ser  
65 70 75 80

Val Ile Leu Leu His Gly Phe Ser Ala Asp Lys Asp Asn Trp Ile Leu  
85 90 95

Phe Thr Lys Glu Phe Asp Glu Lys Tyr His Val Ile Ala Val Asp Leu  
100 105 110

Ala Gly His Gly Asp Ser Glu Gln Leu Leu Thr Thr Asp Tyr Gly Leu  
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Glu Tyr Arg Met Gly Phe Thr Met Thr Gln Pro Pro Phe Leu Pro Trp  
210 215 220

Pro Leu Arg Pro Ser Leu Leu Arg Lys Thr Leu Ala Arg Ala Glu Ile  
225 230 235 240

Asn Asn Lys Ile Phe Ser Asp Met Leu Lys Thr Lys Glu Arg Leu Gly  
245 250 255

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Met Thr Asn Phe Gln Gln Lys Ile Glu Val Lys Met Ala Gln His Pro  
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Leu Pro Thr Leu Ile Met Trp Gly Lys Glu Asp Arg Val Leu Asp Val  
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Ser Ala Ala Ala Ala Phe Lys Lys Ile Ile Pro Gln Ala Thr Val His  
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Oleispira antarctica

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Glu Lys Pro Asn Gln Gly Val Val Ile Ser Val Gly Thr Gly Arg Ile  
35 40 45

Leu Asp Asn Gly Ser Val Gln Ala Leu Ala Val Asn Glu Gly Asp Val  
50 55 60

Val Val Phe Gly Lys Tyr Ser Gly Gln Asn Thr Ile Asp Ile Asp Gly  
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35 40 45

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Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln  
65 70 75 80

Ala Asn Asp Gln Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala  
85 90 95

Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn  
100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Thr Ala Ala Val Val  
115 120 125

Ala Ala Ile Lys Glu Gln Ala Gln Pro Cys Leu Asp Thr Lys Ala Ile  
130 135 140

Ala Gln Val Gly Thr Ile Ser Ala Asn Ala Asp Glu Thr Val Gly Arg  
145 150 155 160

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Leu Ile Ala Glu Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr  
165 170 175

Val Glu Glu Gly Lys Gly Leu Glu Asp Glu Leu Asp Val Val Glu Gly  
180 185 190

Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Ile Asn Asn Gln  
195 200 205

Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp  
210 215 220

Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val  
225 230 235 240

Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly  
245 250 255

Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys  
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Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met  
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Leu Gly Met Ser Leu Glu Thr Ala Asp Pro Ser Ser Leu Gly Thr Ala  
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Ser Lys Val Val Ile Asp Lys Glu Asn Thr Val Ile Val Asp Gly Ala  
325 330 335

Gly Thr Glu Ala Ser Val Asn Thr Arg Val Asp Gln Ile Arg Ala Glu  
340 345 350

Ile Glu Ser Ser Thr Ser Asp Tyr Asp Ile Glu Lys Leu Gln Glu Arg  
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Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Gly  
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Ser Glu Met Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu  
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His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val Ala Gly Gly Gly  
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Lys Val Thr Arg Ser Ser Leu Gln Ala Ala Ala Ser Ile Ala Gly Leu  
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Asp Ser Ala Gly Leu Glu Val Lys Thr Ala Ser Ala Gly Asp Val Asn  
50 55 60

Leu Thr Tyr Met Glu Arg Gln Gly Ser Asp Lys Asp Asn Ala Glu Ser  
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Val Ile Leu Leu His Gly Phe Ser Ala Asp Lys Asp Asn Trp Ile Leu  
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Phe Thr Lys Glu Phe Asp Glu Lys Tyr His Val Ile Ala Val Asp Leu  
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Ala Gly His Gly Asp Ser Glu Gln Leu Leu Thr Thr Asp Tyr Gly Leu  
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Ile Lys Gln Ala Glu Arg Leu Asp Ile Phe Leu Ser Gly Leu Gly Val  
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Asn Ser Phe His Ile Ala Gly Asn Ser Met Gly Gly Ala Ile Ser Ala  
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Ile Tyr Ser Leu Ser His Pro Glu Lys Val Lys Ser Leu Thr Leu Ile  
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Leu Ala Glu Gly Lys Asn Pro Leu Ile Ala Thr Asp Glu Ala Ser Phe  
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Glu Tyr Arg Met Gly Phe Thr Met Thr Gln Pro Pro Phe Leu Pro Trp  
210 215 220

Pro Leu Arg Pro Ser Leu Leu Arg Lys Thr Leu Ala Arg Ala Glu Ile  
225 230 235 240

Asn Asn Lys Ile Phe Ser Asp Met Leu Lys Thr Lys Glu Arg Leu Gly  
245 250 255

Met Thr Asn Phe Gln Gln Lys Ile Glu Val Lys Met Ala Gln His Pro  
260 265 270

Leu Pro Thr Leu Ile Met Trp Gly Lys Glu Asp Arg Val Leu Asp Val  
275 280 285

Ser Ala Ala Ala Ala Phe Lys Lys Ile Ile Pro Gln Ala Thr Val His  
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Page 13

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<212> DNA  
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<220>  
<223> fusion of native chaperonin-coding fragments with esterase of *Oleispira antarctica*

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20 25 30

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35 40 45

Leu Asp Asn Gly Ser Val Gln Ala Leu Ala Val Asn Glu Gly Asp Val  
50 55 60

Val Val Phe Gly Lys Tyr Ser Gly Gln Asn Thr Ile Asp Ile Asp Gly  
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35 40 45

Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Lys Asp  
50 55 60

Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Gln  
65 70 75 80

Ala Asn Asp Gln Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala  
85 90 95

Gln Ala Ile Ile Ser Glu Gly Leu Lys Ser Val Ala Ala Gly Met Asn  
100 105 110

Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Thr Ala Ala Val Val  
115 120 125

Ala Ala Ile Lys Glu Gln Ala Gln Pro Cys Leu Asp Thr Lys Ala Ile  
130 135 140

Ala Gln Val Gly Thr Ile Ser Ala Asn Ala Asp Glu Thr Val Gly Arg  
145 150 155 160

Leu Ile Ala Glu Ala Met Glu Lys Val Gly Lys Glu Gly Val Ile Thr  
165 170 175

Val Glu Glu Gly Lys Gly Leu Glu Asp Glu Leu Asp Val Val Glu Gly  
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180                    185                    190

Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe Ile Asn Asn Gln  
195                    200                    205

Glu Lys Met Thr Val Glu Met Glu Asn Pro Leu Ile Leu Leu Val Asp  
210                    215                    220

Lys Lys Ile Asp Asn Leu Gln Glu Leu Leu Pro Ile Leu Glu Asn Val  
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Ala Lys Ser Gly Arg Pro Leu Leu Ile Val Ala Glu Asp Val Glu Gly  
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Gln Ala Leu Ala Thr Leu Val Val Asn Asn Leu Arg Gly Thr Phe Lys  
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Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met  
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Leu Gln Asp Leu Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu  
290                    295                    300

Leu Gly Met Ser Leu Glu Thr Ala Asp Pro Ser Ser Leu Gly Thr Ala  
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Ser Lys Val Val Ile Asp Lys Glu Asn Thr Val Ile Val Asp Gly Ala  
325                    330                    335

Gly Thr Glu Ala Ser Val Asn Thr Arg Val Asp Gln Ile Arg Ala Glu  
340                    345                    350

Ile Glu Ser Ser Thr Ser Asp Tyr Asp Ile Glu Lys Leu Gln Glu Arg  
355                    360                    365

Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Gly  
370                    375                    380

Ser Glu Met Glu Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala Leu  
385                    390                    395                    400

His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val Ala Gly Gly Gly  
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Val Ala Leu Ile Arg Ala Leu Ser Ser Val Thr Val Val Gly Asp Asn  
420                    425                    430

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Glu Asp Gln Asn Val Gly Ile Ala Leu Ala Leu Arg Ala Met Glu Ala  
435 440 445

Pro Ile Arg Gln Ile Ala Gly Asn Ala Gly Ala Ala Gly Ala Ala Val  
450 455 460

Val Asp Lys Val Lys Ser Gly Thr Gly Ser Phe Gly Phe Asn Ala Ser  
465 470 475 480

Thr Gly Glu Tyr Gly Asp Met Ile Ala Met Gly Ile Leu Asp Pro Ala  
485 490 495

Lys Val Thr Arg Ser Ser Leu Gln Ala Ala Ala Ser Ile Ala Gly Leu  
500 505 510

Met Ile Thr Thr Glu Ala Met Val Ala Asp Ala Pro Val Glu Glu Gly  
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Pro Gly Met Met  
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Ser Val Ala Ala Gly Met Asn Pro Met Asp Leu Gln Arg  
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46

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